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it may be justly regarded as a most creditable monument of learning and religious feeling, at a period when the Irish church was about at her best. In its style we observe a great superiority over the Latin of Columbanus, the Book of Armagh, and even Adamnan; and we are naturally inclined to attribute the excellence to foreign association. The composition which most resembles it in tone and vigour is the admirable Paschal Epistle of Cumian, written about twenty-five years before.*

In a theological point of view, this is the most interesting relique of Irish learning; and, though we may well conceive that our numerous monasteries with their numerous *Ferleighinns* produced many works of even greater merit, still we have to deplore the merciless rule of barbarism which swept away all domestic evidences of advanced learning, leaving scarcely anything on record at home but legendary lore, and has compelled us to draw from foreign depositories the materials on which to rest the proof that Ireland of old was really entitled to that literary eminence which national feeling lays claim to, and general consent is disposed to concede.

The REV. H. LLOYD, D.D., read the following communication from Professor HANSTEEN, of Christiania:—

ON THE AMPLITUDE OF THE DAILY VARIATION OF THE MAGNETIC DIP IN CHRISTIANIA BETWEEN 10 A. M., AND AN HOUR BEFORE SUNSET, FROM 1844 TO 1859.

“In the following Table *n* is the number of days in each month upon which the dip has been observed at its maximum in the morning, and at its minimum in the afternoon. *Variation* is the difference between *inclinatio antemeridiana* and *postmeridiana*, which has, without exception, been always positive.

Month.	<i>n</i>	Variation.
January, ...	18	+ 0' 382
February, ...	17	+ 0' 329
March, ...	25	+ 0' 974
April, ...	35	+ 2' 365
May, ...	48	+ 3' 155
June, ...	59	+ 3' 231
July, ...	30	+ 2' 787
August, ...	37	+ 1' 766
September, ...	36	+ 1' 831
October, ...	18	+ 1' 227
November, ...	18	+ 0' 928
December, ...	15	+ 0' 239

* Ussher, Sylloge Epist. Hbi. xi. (Works, vol. iv., p. 432).

“The observation of the true magnetic dip does not depend upon any difficulty in *reading* the position of the needle when it is in equilibrium; but only upon the question, if when the horizontal axis has been elevated from the agates, it *always returns* to the *same points of division*. With large needles, like those of Gambey, with good lenses opposite both ends of the needle, when the axis has been elevated from the agates, and the needle makes oscillations of 30, 40, or 50 minutes, I observe three consecutive extremes,—a minimum α , a maximum β , and a minimum γ . Each of these can be observed correctly to a minute. The true position in equilibrio is then $\frac{1}{2} \left[\frac{\alpha + \gamma}{2} + \beta \right]$. In the oscillation of the needle, and its mechanical moment, every obstacle, such as a little friction and small irregularities in the pivots of the axis, is overcome. Observing the same three extremes at the other end of the needle before a new elevation of the axis, I then take the mean of these two means. In the same position of the needle, I repeated this formerly four times; so that in the eight different positions of the needle and limb I had thirty-two readings of each end of the needle. As I found by long experience that the four means, in every position, differed very little from each other, I have in the latter two years diminished them to three.

“With your little circle, with microscopes, it is necessary to *wait* till the needle is *quiet*, and to direct the wire to the upper point of the needle, and read both verniers, then to the lower point, and read again. But when the needle makes only an angle of 3, 4, or 5 minutes with the true position of equilibrium, its moment is so weak, that the least effect of friction, and irregularity in the pivots, can stop it in a false position. I therefore regard the microscopes as unnecessary, and even injurious. It is true that a correct dip depends also upon the skill and experience of the observer; and I confess that for a dilettante, who makes an observation for the first time, the microscope may be agreeable, as it gives an imaginary correctness.

“The above-cited facts of the daily variation, observed with Gambey’s instrument, without microscopes, are a clear proof of this. I have not seen that any observer with the small Barrow has detected the daily variation, and its gradual increase from the winter to the summer solstice.

“From April, 1859, there has arisen a period of great perturbations, with flashings of polar light (*Aurora Borealis*), and great spots in the sun. The daily variation is still always positive, but extraordinarily great: it has once amounted to $1^{\circ} 2'$; and the variations of the Bifilar have been great in proportion. As the latter instrument is always observed by an assistant twice in the same hour with my observations of the dip, I will give some examples:—

1859.	Daily Variation.		
	Dip.	Bifilar.	
April 21, . . .	+ 27'·47	- 485·0	Aur. Bor. evening.
" 22, . . .	+ 7'·04	- 131·7	Ditto.
June 8, . . .	+ 17'·02	- 295·9	{ Aur. Bor. could not be seen for the crepusculum.
July 11, . . .	+ 16'·66	- 268·5	
" 19, . . .	+ 12'·33	- 181·7	{ 21, Vehement Aur. Bor. evening ; 28, and midnight.
August 22, . .	+ 7'·51	- 133·9	
" 29, . . .	+ 11'·76	- 179·1	
September 2, .	+ 82'·03	- 801·3	{ Aur. Bor. 17, 18, 20, evening.
October 18, . .	+ 19'·69	- 355·7	
" 21, . . .	+ 16'·21	- 259·1	
1860.			
February 21, .	+ 4'·08	- 168·2	Aur. Bor. evening.
May 24, . . .	+ 8'·97	- 180·8	

" Every time that I saw in the evening observation, in my tent, an extraordinarily *small dip*, I was sure that the Bifilar marked a *strong horizontal intensity*, which never failed. The Bifilar variation above given is the difference of parts of the scale (forenoon - afternoon). For instance :—

		Dip.	Bifilar.
September 2, .	10 ^h 23 ^m A. M.,	71° 29'·01	637·56
"	4 ^h 16 ^m P. M.,	70 26·98	1438·91
	Difference, . .	+ 1 2·03	- 801·35

" One part of the scale of the Bifilar = $\frac{1}{13970}$ of the horizontal intensity.

" HANSTEEN."

Dr. Lloyd communicated also to the Academy the following extract from a letter from Professor Hansteen, dated April 17, 1861 :—

" At our interview in Christiania, in July, 1860, I communicated to you the mean *daily variation* of the magnetic dip in this place between its maximum at 10 A. M., and its minimum, about half an hour before sunset, for every month in the year, deduced from different years between 1844 and 1859. This variation, which at the winter solstice was only a fraction of a minute, increased very regularly to a little more than three minutes towards the summer solstice, and decreased again as gradually towards December.

" In order to ascertain if there is a *monthly variation* of the dip in the course of the year, I began, from April, 1855, to observe the dip in its daily maximum and minimum, generally five or six days about the middle of each month, to this year. The mean of the daily maximum and minimum, is contained in the following Table :—

	1885.	1886.	1887.	1888.	1889.	1890.	1891.	Means, 1886-1890.
January, . .	.....	71° 25' 858	71° 23' 386	71° 25' 114	71° 22' 754	71° 21' 561	71° 20' 183	71° 23' 735
February, . .	.....	26 544	24 283	24 110	22 824	20 645	21 330	23 671
March, . . .	.....	25 558	24 164	24 478	22 727	23 657	21 891	24 117
April, . . .	71° 27' 985	24 322	23 771	24 057	20 095	21 828	19 582	22 875
May, ...	26 050	23 885	23 942	23 205	20 072	20 331	.....	22 277
June, ...	26 032	23 635	22 794	22 585	20 201	20 678	.....	21 978
July, . . . .	.. ..	23 724	23 133	22 158	20 866	20 783	.....	22 133
August, . . .	25 820	23 640	23 806	21 506	22 220	20 785	.....	22 291
September, .	27 225	24 660	25 612	22 998	23 427	21 868	.....	23 713
October, . . .	26 796	25 337	24 774	23 784	23 068	21 739	.....	23 740
November, . .	26 370	24 047	24 849	22 701	22 913	21 618	.....	23 224
December, . .	25 235	24 078	23 458	23 340	21 633	21 248	.....	22 751
Mean, . . .	71° 26' 483	71° 24 268	71° 23' 994	71° 23' 336	71° 21' 817	71° 21' 394		

"From the last column in the foregoing Table, it is clear that there is a maximum at the Equinoxes, in March and at the end of September, and a minimum at the Solstices, in June and December. The greatest variation is between March and June, and is equal to $2'139$. The mean yearly decrease between 1856 and 1860 = $0'718$; but between the incomplete year 1855, and 1860, it is $1'008$.

"Three days after your departure from Christiania, I was going in a steamer along the coast to Trondhjem, sent by the University to represent it, as its senior member, at the coronation of the king and queen. I made observations of the magnetical intensity and dip in Bergen and in Trondhjem on different days. I shall only communicate the latter, with former observations by different observers.

TRONDHJEM.

Inclination = i ; Horizontal Intensity = H .

t .	Observer.	i .	Formula.	Δ .	t .	Observer.	H .	Formula.	Δ .
1823·70	Sabine,	$74^{\circ} 43'05$	$74^{\circ} 44'80$	$-1'75$	1825·5	Hansteen,	1·3425	1·3423	+2
1825·50	Hansteen,	$-40'70$	$-37'65$	$+3'05$	1832·59	Hansteen,	1·3579	1·3586	-7
1832·57	Hansteen,	$-10'75$	$-12'97$	$-2'22$	1838·47	Boeck,	1·3707	1·3702	+5
1838·51	Meyer,	$73^{\circ} 57'31$	$73^{\circ} 56'18$	$+1'13$	1860·59	Hansteen,	1·3992	1·3992	0
1860·61	Hansteen,	$-25'50$	$-25'65$	$-0'15$					

$$i = 74^{\circ} 21'362 - 3'4005 (t - 1830) + 0'051509 (t - 1830)^2.$$

$$H = 1\cdot3410 + 24\cdot925 (t - 1825\cdot0) - 0\cdot24116 (t - 1825\cdot0)^2.$$

These formulæ give the following values for the yearly decrease of dip and intensity :—

t .	Δi .	ΔH .
1825	$-3'915$	$+24\cdot9$
1830	$-3'400$	$+22\cdot5$
1835	$-2'885$	$+20\cdot1$
1840	$-2'370$	$+17\cdot7$
1845	$-1'855$	$+15\cdot3$
1850	$-1'340$	$+12\cdot9$
1855	$-0'825$	$+10\cdot5$
1860	$-0'310$	$+8\cdot0$

"The minimum of dip = $73^{\circ} 25'38$, and corresponds to the epoch $t = 1862\cdot97$. The maximum of intensity = $1\cdot4054$, corresponding to the year 1876-7. The total and vertical intensity can be calculated from the computed results, or from the observed quantities."

Dr. Lloyd observed that there could be no doubt of the excellence of the observations recorded in the foregoing communication : they afforded abundant proof, both of the perfection of the instruments employed by Professor Hansteen, and of his skill in using them. But the fact that the diurnal variation of the inclination has not been observed with the English dip circles could not, he thought, be fairly adduced in proof of their inferiority to the French instruments ; inasmuch as this element is obtained by us more completely by other instrumental means. By means of the balance magnetometer (combined with the bifilar magnetometer) not only the range, but the *whole course* of the diurnal variation of the inclination, has been completely determined at Dublin ; and the same thing is true of other places at which both these instruments have been employed. In fact, it is in this circumstance that the advantage of the British observatories over those of the Continent mainly consists, the daily observations of the latter being limited to two of the three magnetic elements.

Dr. Lloyd believed that it was unnecessary for him to enter further into the question of the accuracy attainable by the dip circles of the form now used by English observers, as the subject would be fully discussed by Mr. Stoney in a paper to be read by him to the Academy that evening. He would merely observe that Professor Hansteen seemed to be under a misconception in supposing that it was necessary, with these instruments, to observe the needle *at rest*. By the help of a small divided scale in the focus of each of the microscopes, the wires may be either *placed* in the position of equilibrium, while the needle itself is in motion, or (the microscopes being fixed) the deviation of the wires from that position may be observed, and added, with its proper sign, to the readings of the verniers. This simple addition had, in fact been made in the original instrument of this construction, which was made by Mr. Barrow for Dr. Lloyd, and according to his specifications.

Mr. G. J. STONEY read a paper—

ON THE DEGREE OF ACCORDANCE WHICH MAY BE ATTAINED IN OBSERVATIONS
MADE WITH DR. LLOYD'S DIP CIRCLES.

IN fixed magnetic observatories the instruments may be mounted with every appliance, however cumbersome, which contributes to accuracy ; but when we mean to carry an instrument from station to station, making observations with it at each, the necessity that it be of moderate size, and not easily injured or thrown out of adjustment, debars us from many arrangements which we might otherwise make. Yet with such travelling instruments very considerable degrees of accordance have been attained, and, as I think, much more accuracy is within our reach, by attention to a small mechanical detail.

In the most sensitive of the travelling dip circles for use on shore, the needle rests by a thin and most carefully constructed transverse axis on two smooth horizontal pieces of agate, upon which the axis rolls without rubbing as the needle oscillates before coming to rest. A wonderful degree of delicate mechanical accuracy has been attained in the construction of this minute cylindrical axes, an accuracy which would